

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/3/2/1428						
Classification	Serious Incident	Date	21 August 2023		Time	1115Z	
Type of Operation	Private (Part 141)						
Location							
Place of Departure	Lanseria International Airport (FALA), Gauteng Province		Place of Intended Landing		Wonderboom Airport (FAWB), Gauteng Province		
Place of Occurrence	Lanseria International Airport (FALA), Gauteng Province						
GPS Co-ordinates	Latitude	25°55'38" S	Longitude	027°56'14" E	Elevation	4 500 ft	
Aircraft Information							
Registration	ZS-STP						
Make; Model; S/N	Cessna C172 (Serial Number: 17266715)						
Damage to Aircraft	None		Total Aircraft Hours	8608.4			
Pilot-in-command							
Licence Type	Commercial Pilot Licence (CPL)		Gender	Male		Age	35
Licence Valid	Yes		Total Hours	1380		Total Hours on Type	1380
Total Hours 30 Days	31		Total Flying on Type Past 90 Days	39			
People On-board	2+0		Injuries	0		Fatalities	0
						Other (on ground)	0
What Happened							
<p>On Monday, 21 August 2023 at 0910Z, an instructor pilot and a student pilot (holder of a PPL) took off on an instrument flight rules (IFR) navigational flight from Wonderboom Airport (FAWB) with the intention to conduct letdown approach PNV very high omni-directional range (VOR) exercises at Pilanesberg Airport (FAPN), and then route to Lanseria LIV-VOR before conducting an instrument landing system (ILS) approach for Runway (RWY) 07 at Lanseria International Airport (FALA) and a touch-and-go landing before returning to FAWB. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>According to the student pilot, the letdown approach at FAPN was initiated at 7000 feet (ft) and was uneventful. Thereafter, they proceeded to FALA at flight level 090 for an ILS approach on RWY 07. They were given radar vectors by Johannesburg Approach to join and establish on the ILS localiser. After being established on the localiser and descending as required, they performed a touch-and-go landing on RWY 07 before they climbed out, routing back to FAWB. Whilst passing through approximately 6 500 ft above mean sea level (AMSL), the engine surged twice. The instructor took over the control of the aircraft and broadcasted an emergency call (MAYDAY) to Johannesburg Radar. The air traffic control (ATC) officer on duty advised them to return to FALA and they were vectored to the aerodrome and given priority landing on RWY 25. The aircraft did not make it to RWY 25; it landed approximately 300 metres short of RWY 25. Shortly after landing, the Airport Rescue and</p>							

Fire Fighting (ARFF) personnel responded to the scene. Both crew members were not injured. The aircraft was also not damaged.

Following this incident, the aircraft was found to have used up all available fuel on-board, and this is the reason the engine surged and stopped.

CAR part 91 in terms of flight planning States:

91.07.12 Fuel and oil requirements

(1) A pilot-in-command of an aircraft shall not commence a flight unless he or she is satisfied that the aircraft is carrying sufficient amount of usable fuel and sufficient oil to complete the planned flight safely and to allow for deviations from the planned operation.

(2) The pilot-in-command shall ensure that the amount of useable fuel to be carried shall, as a minimum, be based on—

(a) the following data—

- (i) current aircraft-specific data derived from a fuel consumption monitoring system, if available; or*
- (ii) if current aircraft-specific data is not available, data provided by the aeroplane manufacturer; and*

(b) the operator conditions for the planned flight including—

- (i) anticipated aeroplane mass;*
- (ii) notices to Airmen;*
- (iii) current meteorological reports or a combination of current reports and forecasts;*
- (iv) air traffic services procedures, restrictions, and anticipated delays; and*
- (v) the effects of deferred maintenance items and/or configuration deviations.*

(3) The pre-flight calculation of usable fuel required shall include—

- (a) Taxi fuel, which shall be the amount of fuel expected to be consumed before take-off; taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;*
- (b) Trip fuel, Which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of paragraph (b) of sub-regulation [91.07.12](#) (2);*
- (e) Final reserve fuel, which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required—*
 - (i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the Director.*



Figure 1: The ZS-STP after the successful landing. (Source: Operator)

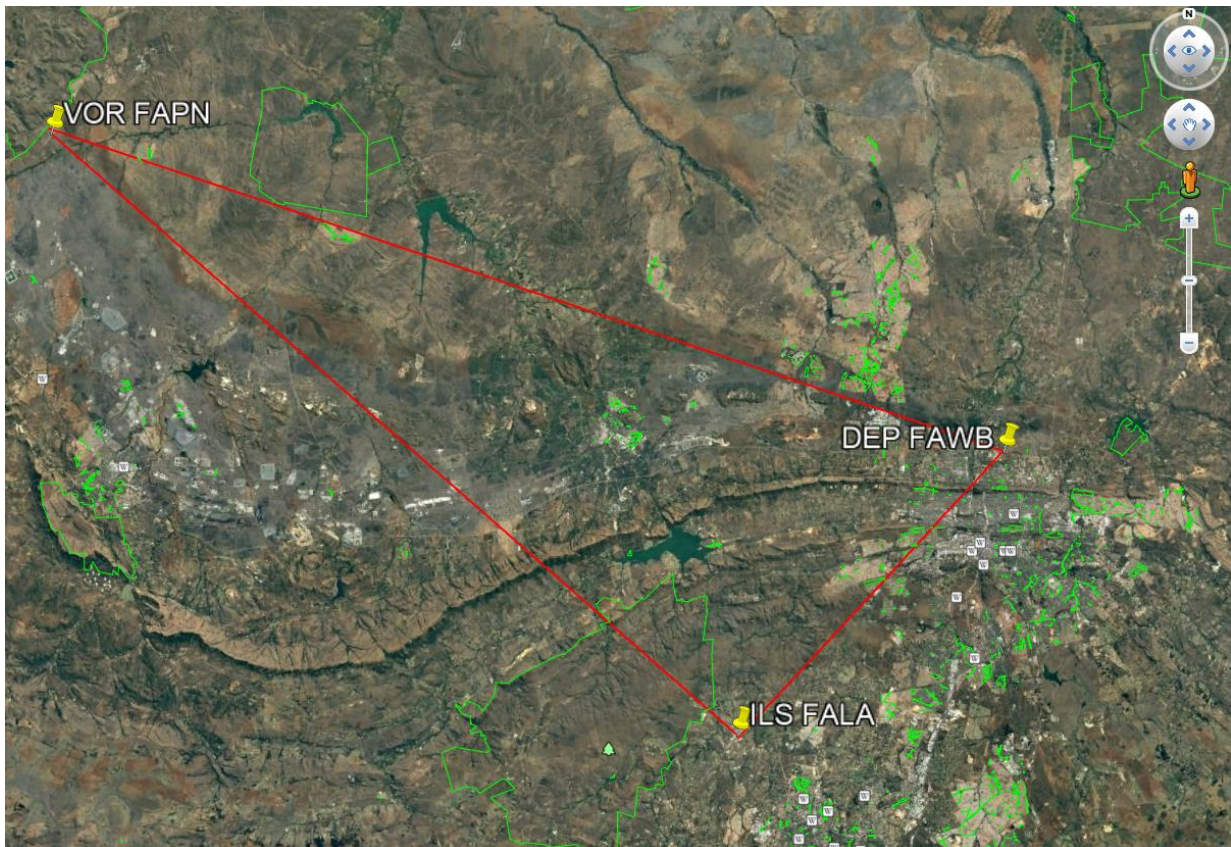


Figure 2: Routing and aerial work. (Source: Google Earth)

Fuelling & Fuel Levels Before Flight Commences:

This RED Tag notice is to remind Pilots/Crew and instructor's to:

1. Checking Fuel – Levels can be check Visually and if it can't be determined Fuel Measuring equipment NOT Fuel Gauges must be used – Fuel Measuring Sticks, with a string attached MUST be used.
2. Instructors must check before each flight commences even if the student has checked the fuel the instructor must check the fuel level themselves.
3. Students/ Instructors or Hire and Fly clients need to determine that the fuel on board will be sufficient for the duration of the flight as well as reserve fuel according to SACAA requirements.

Figure 3: Schematic layout of the main landing gear. (Source: Operator)

Findings

1. The instructor had a valid Commercial Pilot Licence (CPL). He was appropriately rated as a Grade II instructor with the aircraft type rating endorsed on his licence, which was issued on 14 July 2023 with an expiry date of 31 July 2024. The instructor's medical certificate was issued on 29 June 2023 with an expiry date of 30 June 2024 and with no limitations.
2. The student pilot had a Private Pilot Licence (PPL) which was issued on 10 September 2022 with an expiry date of 30 September 2024. The student pilot's medical certificate was issued on 30 September 2022 with an expiry date of 30 September 2026 and with various limitations. The student pilot had a total of 163.6 hours of flying experience.
3. The aircraft's last annual inspection was conducted on 30 June 2023 at 845.4 airframe hours, after which a Certificate of Release to Service (CRS) was issued with an expiry date of 1 June 2024 or at 880.0 hours, whichever comes first.
4. The aircraft's Certificate of Airworthiness (C of A) was originally issued on 25 March 2011. The latest C of A was renewed on 22 March 2023 with an expiry date of 31 March 2024.

5. The Certificate of Registration (C of R) was issued to the present owner on 26 May 2017.
6. The student pilot had calculated that they needed 3 hours of fuel endurance, which is approximately (3x8=24) 24 gallons (GAL). The aircraft's useable fuel is 40 gallons (GAL) when full, and the fuel consumption is 8 GAL/hour.
7. After the touch-and-go landing at FALA and the initial climb whilst routing to FAWB, the aircraft had covered 2.03 hours of flight time when the engine surged and, eventually, stopped. This meant that the aircraft had 17 GAL of fuel when they departed FAWB.
8. According to the instructor, the student pilot advised him that he thought the previous flight only used 1 hour of fuel based on what he saw on the flight folio and that they had approximately 4 hours endurance. The student pilot simply conducted a visual inspection of the fuel tanks and did not use a measuring stick to confirm the fuel levels, and the instructor did not verify the fuel levels.
9. The aircraft ran out of fuel, which led to the engine surge and stoppage due to fuel exhaustion. The cause was attributed to the student pilot not using a fuel measuring stick and the instructor not verifying the fuel on-board the aircraft prior to the flight.
10. Following this incident on 22 August 2023, the operator issued a "Red Tag" notice to remind the pilots/crew and instructors that fuel measuring sticks must be used to measure fuel and that instructors must verify the fuel level before each flight.

Probable Cause(s)

Engine failure due to fuel exhaustion which was caused by failure to verify fuel on-board by both the instructor and the student pilot.

Contributing Factor(s)

1. Failure to comply with the CAR Part 91 in terms of flight planning.
2. Failure of the student pilot to use a measuring stick to confirm fuel level in the tanks.
3. Failure of the instructor to verify the student pilot's fuel measurements.

Safety Action(s)

The operator issued a "Red Tag" notice to students and instructors to always use a fuel measuring stick to verify fuel on-board prior to each flight.

Safety Message and/or Safety Recommendation/s

None.

About this Report

The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation and that will determine the scope of an investigation. For this occurrence, a limited investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desk top enquiries to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar occurrence.

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not to apportion blame or liability.

Disclaimer

This report is produced without prejudice to the rights of the AIID, which are reserved.

**This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa**